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1. Instability at A_2 and C_1.

In tests to uncover instability at the A_2 and C_1 loci twenty-two newly induced and independent changes have been confirmed in a population of over 10 million gametes. These unstable loci representing a wide spectrum of states (time and frequency of the mutation event) were found in a_1^m lines containing the En system and will be tested to: (1) identify the controlling-element system involved, (2) determine the state of each, and (3) compare the state induced with the state of the original a_1 mutable. Although there are differences in states between lines (resulting in identifiable patterns), the patterns of mutants isolated within lines are strikingly uniform. This suggests that the transposable element is the determinant for the pattern phenotype.

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2. Phase variation of regulatory elements.

Two particular phenotypes represented by reciprocal patterns of mutability in the aleurone are due to the modification of activity of the regulatory elements (Enhancers, En) governing mutability at the a_1^m locus. The one, En(flow), is active at the base of the kernel but inactive at the crown, while the other, En(crown), is active at the crown of the kernel but inactive at the base. Mutability is found only where En is active. It is hypothesized that here the regulatory elements "switch on" and "switch off" (phase variation) during development of the endosperm.

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3. Linkage and control of mutability of w^m_{13} - a white seedling mutable.

A white mutable seedling, w^m_{13}, was found among the progeny of some pg^m lines. The states of w^m_{13} mutability, like those of pg^m, vary from very early to very late. Stable forms have been isolated. w^m_{13} is located on chromosome 3, 28-30 units from a_1 and near lg_2. Its exact location with reference to lg_2 is under investigation.

In order to determine whether the mutability of w^m_{13} is related to the En system, crosses were made with the $a_1^{m(r)}$ tester - $a_1^{m(r)}$. From the cross, $a_1^{m(r)}/a_1$ sh x w^m_{13}

$\underline{a}_1$ $\underline{sh}/\underline{a}_1$ $^{m(r)}$ $\underline{Sh}$, (non-variegated $\underline{Sh}$ x variegated $\underline{Sh}$) variegated and non-variegated non-shrunken ($\underline{Sh}$), and non-variegated shrunken ($\underline{sh}$) kernels were selected, and plants obtained from these were selfed in order to test the presence of $\underline{w}^m_{13}$.

Three sets of progeny (1, 2 and 3) of three crosses.

	progeny of $\underline{w}^m_{13}$	$\underline{w}^m_{13}$ in selfed progeny absent	present
variegated $\underline{Sh}$	1	5	17
	2	2	19
	3	0	13
non-variegated $\underline{Sh}$	1	21	0
	2	22	0
	3	14	0
non-variegated $\underline{sh}$	1	8	8
	2	4	19
	3	6	14

The data indicate that $\underline{En}$ is part of or closely linked to $\underline{w}^m_{13}$. Most of the variegated $\underline{Sh}$ progeny are associated with $\underline{w}^m_{13}$; some, however, are without $\underline{w}^m_{13}$. This indicates that $\underline{En}$ is separable from $\underline{w}^m_{13}$, except that the same result could be obtained from the mutation of $\underline{w}^m_{13}$ to $\underline{W}_{13}$ (green). Distribution of progeny types in the non-variegated $\underline{Sh}$ class supports the indication of a close relationship between $\underline{w}^m_{13}$ and $\underline{En}$. If $\underline{En}$ were separable from $\underline{w}^m_{13}$, $\underline{w}^m_{13}$ would be expected to occur in a ratio reciprocal to that of the variegated $\underline{sh}$ class. None were found. Results obtained and listed under the heading non-variegated $\underline{sh}$, show linkage of $\underline{w}^m_{13}$ with $\underline{a}_1\underline{sh}$. The non-$\underline{w}^m_{13}$ progeny arise from crossovers between $\underline{sh}$ and $\underline{w}^m_{13}$ which is near $\underline{lg}_2$. $\underline{En}$ is either part of the $\underline{w}^m_{13}$ complex or it is closely linked to $\underline{w}^m_{13}$. This relationship is now being tested further.

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1. Linkage studies involving the $\underline{a}_2$-$\underline{bt}_1$ region of chromosome five.

For the past several years we have undertaken a rather intensive crossover study of the region from $\underline{a}_2$-$\underline{bt}_1$ in